

Learn the real science behind the **FUN!**

Pokémon
TRADING CARD GAME



For more real science visit:
<http://ksnn.larc.nasa.gov/pokemon>

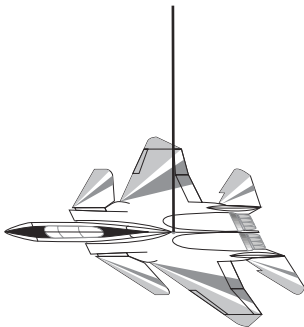


Diagram 4

Purpose

To discover the center of gravity by balancing a cardstock (two-dimensional) model of an F-15 ACTIVE on a ruler.

Background

An F-15 ACTIVE (Advanced Control Technology for Integrated Vehicles) plane is a modified F-15 fighter plane. This is a highly maneuverable fighter that can reach speeds of Mach 2 and travel to high altitudes. Mach speed is the speed of sound. It was a “special one-of-a-kind” airplane flown by NASA and the U.S. Air Force research pilots to learn more about flying and controlling planes.

NASA engineers need to know the exact place to balance a real plane, just as you’ll work to balance this model. This place is called the center of gravity. The center of gravity is the average location of the weight of an object. Weight is the measure of the force of gravity. The whole weight of an object can balance at this point. The center of gravity affects the stability of an aircraft.

Procedure

1. Carefully cut out the cardstock F-15 ACTIVE model.
2. Try to balance this model on your finger.
3. Work with a group of two or three other students.
Tape a ruler to the end of a table. See diagram 1.
4. Try to balance the nose of the F-15 ACTIVE model on the edge of a ruler. Draw a straight line down the middle of the F-15 ACTIVE with a crayon. See diagram 2.
5. Turn the F-15 ACTIVE model so the nose is parallel to the table. Try to balance the model now.
6. Once the model is balanced, draw a line at the end of the ruler. Extend this line. See diagram 3.
7. Where the lines intersect is the center of gravity.
8. Ask your teacher to punch a small hole at this point using the needle and string.
9. Tie a large knot on the bottom of the string, large enough so that it won’t pull through the hole. See diagram 4.
10. Hang the model from the ceiling.

Conclusion

1. Experiment with adding paperclips to the plane. What happens when you change the center of gravity?
2. What might happen if you changed the shape of the plane? Experiment to test your prediction.
3. Is it important to have a symmetrically shaped object for this experiment? Why or why not?

Extension

1. Use thicker paper or cardboard for your model and see how it affects the center of gravity.
2. Try to “fly” your model. Make any modifications needed to get some “lift” from your model.

MATERIALS

Per Student

cardstock F-15 ACTIVE
plane (p. 2)

scissors

Per Group

ruler

crayon

masking tape

For the Class

needle and string

paper clips

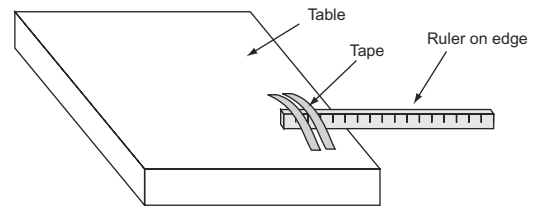


Diagram 1

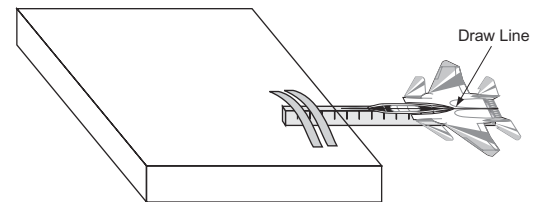


Diagram 2

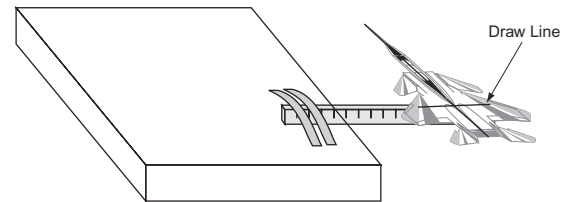


Diagram 3

Drawing of F-15 ACTIVE
(Teachers, copy this page on to cardstock.)

